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Short-term Hotel Room Price Effects of Sporting events

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Abstract

A difference-in-differences analysis is used to investigate the short-term price effects of eight sporting events in Finnish Lapland. The data originates from a hotel reservation system for nine hotels which are located within an area where sporting events are a regularly held. The control group consists of hotels further away that are not affected by the event. Robust regression analysis based on 220,000 room bookings over a period of five years show that hotel room prices rise by 14 per cent on average during the event, when booking and guest specific factors are held constant. For the pre-event period, no significant positive price effect can be detected and for the post-event period there is even a significant negative effect of 6 per cent, on average. In addition, there is a large variation in the price effects across the different sporting events, with the highest for the Levi FIS Alpine Ski World Cup competition (60 per cent) and no effect for some small-scale events. Quantile regressions show that price effects are slightly higher for high-priced than for low-priced rooms.

Keywords: hotel prices, sporting events, difference-in-differences analysis, quantile regression, hotel booking system

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1. Introduction

Nowadays many small sporting events are organised all over the world. Major sporting events have become important attractions for tourists, such as mega-events like the Olympics (Baade and Matheson, 2016; Hall, 1992; Hudson, 2012; Nicolau and Sharma, 2018). The type of sporting events vary markedly, ranging from one day marathons to multi-day mega events. Sporting events typically last a short time, but may have positive economic effects on accommodation, hospitality, transport and retail shopping due to the inflow of both participants and spectators. There are many studies available on economic effects of sporting events, but only a few examine the short-term impacts on hotel prices. Measuring the price effects of events is important, as local governments and stakeholders (such as hoteliers) often support these activities financially and expect them to have an impact on the local economy (Burgan and Mules, 2001). Knowledge about the price effects of major sporting events is also important for calculating their economic value.

This study explores the short-term effects of sporting events on hotel room prices. We estimate the impact of sporting events on room prices using a difference-in-difference strategy. The study covers the eight largest sporting events in Finnish Lapland over a five-year period. This information is linked to detailed booking data from a hotel reservation system covering nine hotels within the same area. The control group consists of booking data belonging to hotels of the same chain located far from the sporting event. The empirical analysis is based on 220,000 bookings for the period 2011 to 2016. The analysis includes events in the winter season (e.g. Levi FIS Alpine Ski World Cup and Arctic Lapland Rally) and summer season (Rovaniemi Marathon, Levi Ruskamarathon, Kilpisjärvi Ice Fishing Competition and Kilpisjärvi Midsummer Outdoor Activity Event).

Few studies investigate the short-term price effects of sporting events using daily data and the objective within these studies still vary. For the United States, Depken and Stephenson (2018) find that small sporting events lead to a temporary increase in the average daily rate of hotels. The price effects of sporting events ranges between USD 5 and USD 55. Chikish et al. (2019) analyse the effect of professional sporting events and concerts on the performance of nearby hotels measured as the average daily rate. Regression results based on daily data show that price effects depend on the distance of the hotel from the venue and, overall, negative effects predominate.

Earlier studies use aggregate data at the city or district level to investigate the price effects of sporting events. Porter and Fletcher (2008) reveal that the Summer Olympic Games in Atlanta and the Winter Olympic Games in Utah leads to a significant increase in hotel room rates. Solberg and Preuss (2007) show that revenues per guest night (deflated by the consumer price index) in the year of the Sydney Olympics increased by 11 per cent, but the trend is reversed thereafter. Barreda et al. (2017) investigate the impact of FIFA World Cup (2014) on hotel prices (RevPAR and ADR) in the participating cities. The authors find that hotel prices rise during the FIFA World Cup but quickly decrease after the event, to a price level similar to that of the pre-event period.

An important feature of the literature is that the majority of studies focus on the average price effects based on aggregate data at the city or district level and rarely examine the price effects after the end of the event. Exceptions are Depken and Stephenson (2018) and Chikish et al. (2019) who use large samples of individual hotels. The investigation of the post-event price effects is important because an extended stay would indicate a wider effect of the event (Depken and Stephenson, 2018).

It is well known that room rates typically differ widely across hotels and even within the same hotel depending on booking time and many other guest- and booking characteristics (Falk and Vieru, 2019), usually due to the use of dynamic pricing methods (Abrate, Nicolau and Viglia, 2019). The use of extensive information from individual booking data makes it possible to account for the price variation across season, between weekends and weekdays, holiday period, date of booking and many other room- and booking characteristics. In addition, the majority of previous studies are conducted without comparing the price effects to a control group of accommodations that are not affected by the event. An exception is the study by Porter and Fletcher (2008) who use other districts in Utah as the control group. Chikish et al. (2019) use hotels further away from the event venue as a control group. To the best of our knowledge, this is the first study to examine the price effects of sporting events using a difference-in-differences analysis based on disaggregated data originating from a hotel booking system.

The study focuses on the short-term impacts of small-scale sporting events on accommodation prices. These events differ from mega sporting events in many respects (Gibson, Kaplanidou and Kang, 2012); their duration are usually shorter and they may attract a higher proportion of local residents. In general, small-scale sporting events affect not only accommodation prices and occupancy but also expenditures for restaurants, transportations and souvenir shops (Ryan and Lockyer, 2001; Gibson, Willming and Holdnak, 2003). The economic impact of sporting events on accommodation is the most interesting, as accommodation costs usually account for the largest proportion of visitors' costs when attending sporting events (Gratton, Dobson and Shibli, 2000).

The structure of this paper is as follows: Section two outlines the conceptual background while section three introduces the empirical approach. Section four introduces the dataset and the

descriptive statistics. The results are presented and discussed in section five and section six concludes.

2. Conceptual background

The literature focuses almost exclusively on short- and long-term impacts of sporting events on tourist demand (e.g. Brännäs and Nordström, 2006; Fourie and Santana-Gallego, 2011; Kang and Perdue, 1994; Vierhaus, 2019); impacts on aggregate outcome variables, such as GDP per capita and population (Billings and Holladay, 2012; Brückner and Pappa, 2015; Nitsch and Wendland, 2017; Firgo, 2019); or economic impacts on related industries such as accommodation, restaurants, retail and entertainment (Daniels and Norman, 2003; Daniels, Norman and Henry, 2004). Studies focusing on the impact of small-scale events typically estimate the additional revenues to the city generated by the events using stand-alone surveys (Ryan, 1998; Ryan and Lockyer, 2001). Other studies investigating the effects of major sporting events often combine surveys with input-output models including the social accounting matrix or computable general equilibrium (CGE) models (Saayman and Saayman, 2012; Huang et al, 2014). Another strand of the literature investigates the effect of major sporting events on the market value of hotels and airlines in the winning country (Nicolau and Sharma, 2018; Nicolau, Sharma and Zarankin, 2019).

The results of the studies demonstrate that major sporting events have a long-term impact on international tourism in the host country and that this impact is the greatest in the year of the event and decreases over time (Daniels and Norman, 2003; Fourie and Santana-Gallego, 2011; Kang and Perdue 1994; Solberg and Preuss, 2007). Fourie and Santana-Gallego (2011) find that major sporting events lead to an eight per cent increase in tourist arrivals, with a greater impact on the arrivals of the participating countries. However, the Winter Olympics are not significantly linked to tourist arrivals in the host country. Vierhaus (2019) shows that the

hosting of the Summer Olympics significantly increases the number of international tourist arrivals in the host countries before, during and after the event. In contrast, the FIFA World Cup has no long-term impact on tourist arrivals. Baumann and Matheson (2017) investigate the impact of smaller sporting events on airplane arrivals and find that only the Honolulu Marathon generates additional air arrivals. Teigland (1999) shows that the actual tourism impact of the Winter Olympics in Lillehammer is lower than forecasted by the Norwegian national and local authorities, who expected a "big boom" in tourism after the organisation of the 1994 Winter Olympics.

Sporting events as well as other events (festivals and fairs, for instance) attract both out-of-region visitors and locals (Preuss, 2005). These events are usually short-term although still with some variation. Some of them, such as cross-country ski races, need a few days, while others, such as marathons, are seldom more than one-day events. In most cases, out-of-region participants and visitors stay overnight at the venue of the event. This trend is more common in remote regions with a relatively small number of local residents, like Finnish Lapland. Similarly, sporting events with a high proportion of foreign visitors like the Levi FIS Alpine Ski competition lead to a temporary marked surge in local tourism demand. As the accommodation capacity in the host country cannot be expanded at short notice, there is temporarily excess demand for accommodation and this in turn pushes accommodation prices upwards. As a rule, the demand for accommodation during the event period is inelastic for high-priced or high quality room prices, indicating that travellers are willing to pay the higher prices during this specific period of time (Barreda et al., 2017).

Not surprisingly, the majority of studies find positive effects on accommodation prices during sporting events (Barreda et al., 2017; Porter and Fletcher, 2008). For instance, Porter and Fletcher (2008) report that hotel prices increase by 43 per cent during the Summer Olympic

Games in Atlanta and 141 per cent during the Winter Olympic Games in Salt Lake City. Du Plessis and Maennig (2011) note that flight prices during the 2010 FIFA World Cup in South Africa are at least 50 per cent higher than normal. Similarly, in the FIFA World Cup cities (Cape Town, Durban and Gauteng), car rental companies and hoteliers increase their price by a factor of two and three, respectively, during the World Cup. Positive price effects are also reported for trade and world fairs (Soler and G  mar, 2017; Sainaghi et al., 2019). The latter find that hotel prices increase between 25 and 40 per cent during the Milan Expo 2015 as compared to the pre-event period, measured as the average of hotel prices for the same calendar months in the last ten years. Herrmann and Herrmann (2014) show that hotel prices rise during the Munich Oktoberfest by EUR 46 on weekdays and by EUR 24 on weekends compared to non-Oktoberfest days. However, recent studies using detailed data on the average daily rate using the STR database are more sceptical about the price effects of sporting events. Depken and Stephenson (2018) estimate that small sporting events in the United States only lead to a temporary increase in the average daily rate of hotels with price effects in the moderate range. Chikish et al. (2019) demonstrate that the price effects are negligible and depend on the distance to the venue.

There are several reasons why the extent of the price effect of the sporting event might be modest. One reason for this is that the additional demand is lower than expected (Sun et al., 2013). This can be due to the displacement effect described by Hall (1992) or a crowding out effect, described by Baade and Matheson (2004, p. 346) at the 2000 Olympic Games in Sydney as: *“...if some non-residents, who might have visited the country, decide not to do so because of congestion and high prices during the event’s period”*. In other words, due to widespread speculation about congestion and high prices, some tourists avoid the host region and choose

other destinations during the event period. This type of crowding out can lower the magnitude of the price effect.

A general feature of the studies is that they perform a simple price comparison before and after the event without comparing prices with a control group of accommodation not affected by the event. The inclusion of the booking and guest situation is important, as the room prices vary greatly depending on the characteristics even for a short period of time. In this study, the control group consists of hotels that are not affected by the sporting event.

In addition, it is likely that the price effects during the event period depend on the characteristics of the event and the city. Larger sporting events and those with a higher international reputation such as Alpine FIS Ski race competitions likely have higher price effects than smaller events or less internationally known sporting events. Price effects are also likely to be different between rural and urban areas. In rural areas, there are limited alternatives to hotel accommodations while in cities there might be a supply of alternative accommodations such as short-term rentals.

Thus, based on the reasoning above, the first hypothesis postulates that the direct price effect of sporting events is positive. The reason for this is that event visitors are generally less price-sensitive and accept temporary higher hotel prices (Depken und Stephenson, 2018). However, there might be heterogeneity in the price effect across different types of sporting events, leading to the first two hypotheses:

H1: Sporting events lead to higher hotel room rates during the event period.

H2: Type of sporting event leads to heterogeneous price effects.

An important question concerns the price effect after the event. The literature shows that positive price effects are restricted to the period of the event (Depken und Stephenson 2018).

Using hotel data for the host cities during the FIFA World Cup in Brazil in 2014, Barreda et al.

(2017) show that hotel performance rises strongly during the event period but return to their levels of the pre-event period after the event. This holds true for different hotel performance indicators (revenue per available room [RevPAR], average daily rate [ADR], revenues, occupancy levels). Du Plessis and Maennig (2011) find that flight and hotel prices after FIFA World Cup quickly fall to the level before the event. A general characteristic of the studies is that they conduct a simple price comparison before and after the event without comparing prices with a control group of accommodations that are not affected by the event. Thus, the third hypothesis states the duration of the price effects of the sporting event:

H3: Price effects disappear shortly after the event.

The fourth hypothesis relates to the heterogeneity of the price effect of sporting events with respect to low- and high-priced rooms. Typically, room rates differ widely across guests-, booking- and room-characteristics. OLS and robust regression only allow the average price effect of sporting events to be studied. It is likely that high-priced rooms will be more strongly affected by the sporting event. This can be justified by the fact that visitors to sporting events possibly have above-average incomes and are less sensitive to temporary price increases. Thus, the fourth hypothesis can be formulated as follows:

H4: The price effect differs between high- and low-priced rooms.

3. Empirical model

A difference-in-differences (DID) strategy is used to estimate the impact of sporting events on room prices (Angrist and Pischke, 2009). The DID-method is the standard method for analysing the economic impact of major sporting events such as the Olympic Games. Examples of analyses of the economic impact of the Olympic Games are Brückner and Pappa (2015) and Firgo (2019), for both the summer and winter Olympic Games, as well as Nitsch and Wendland (2017) and Billings and Holladay (2012) for the summer Olympic Games. Maennig and Richter

(2012) and Vierhauser (2019) employ the propensity score matching analysis that models the likelihood of cities to host the Olympic. More recently, two studies use synthetic control function approach to analyse the effects of mega events. Pfeifer, Wahl and Marczak (2018) analyse the effects of the South African World Cup while Wang and Song (2019) investigate the effects of the London Olympic Games, Brazil World Cup, and Rio de Janeiro Olympic Games on economic growth. Kontokosta (2012) uses a variant of a DID-method to examine the impact of the Olympic Games on property prices. The author identifies the impact of a specific intervention (Olympic Games) by comparing the differences in the evolution of real estate prices pre-intervention and post-intervention between cities affected by the treatment with those not affected.

In this work, we use a DID-approach. The standard case is that the outcome variable, here room rates, are observed for two groups for two time periods. One group of hotels is exposed to a treatment (i.e. sporting event) in the second period but not in the first period. The second group of hotels is not exposed to the treatment during either period. The control group consists of bookings in hotels belonging to the same hotel chain that are far away from the hotel affected by the event. In particular, the treatment group for each event consists of all bookings of the individual hotel at the event location (except one case with 2 hotels). The control group includes the bookings of the seven (or 8) other hotels (see Table 3). Model 1 specifies the price effects during the event:

$$\ln P_{ijt} = \beta_0 + \beta_1 Treatment_{ijt} + \beta_2 Period_{ijt} + \beta_3 Treatment_{ijt} \cdot Period_{ijt} + X_{ijt}Z + u_{ijt}. \quad (1)$$

where $\ln()$ is the natural logarithm, P_{ijt} is the room price for the booking of hotel j on day t by guest i . *Treatment* is a dummy variable equal to one for bookings at hotels that are affected by the event, and zero otherwise. *Period* is a dummy variable equal to zero when the booked arrival

date is earlier than the event (the pre-event period) and equal to one when arrival date and event date coincide (the event period). The coefficient β_1 captures possible price differences between the treatment and control groups prior to the sporting event and β_2 measures aggregate factors that would cause changes in room rates even in the absence of a sporting event. Coefficient β_3 is the most relevant in this case, since it gives the DID- estimates (treatment effect). X_{ijt} is a vector of control variables (a set of dummy variables for hotels that are not affected by the sporting event, four dummy variables for the type of booking channel, six dummy variables for booking lead time, four dummy variables for the number of adults, four dummy variables measuring the high season (summer holiday period, winter break, Easter and Christmas holiday period), a set of dummy variables for the arrival year with the year 2011 as the reference category, arrival weekday and booking weekday (see Falk and Vieru, 2019 for details)). The price equation can be estimated by OLS (Ordinary Least Squares). To account for influential observations and outliers the robust regression method developed by Huber (1964) is employed. The estimator gives influential observations and outliers a lower weight.

Special attention is paid to the timing of the price effects of events, i.e. whether they are limited to the event period or continue after the end of the event or already occur before the event. Depken and Stephenson (2018) split the possible effect outside the event itself in four groups: two days or one day before as well as one or two days after. In order to investigate the pre- and post-treatment effects, the standard DID-specification is extended by additional interaction terms for these time periods (Models 2 and 3):

$$\ln P_{ijt} = \beta_0 + \beta_1 Treatment_{ijt} + \beta_2 EventPeriod_{ijt} + \beta_3 Treatment_{ijt} \cdot EventPeriod_{ijt} + \beta_4 Postevent_{ijt} + \beta_5 Treatment_{ijt} \cdot Postevent_{ijt} + X_{ijt}Z + u_{ijt}. \quad (2)$$

$$\ln P_{ijt} = \gamma_0 + \gamma_1 \text{Treatment}_{ijt} + \gamma_2 \text{EventPeriod}_{ijt} + \gamma_3 \text{Treatment}_{ijt} \cdot \text{EventPeriod}_{ijt} + \gamma_4 \text{Postevent}_{ijt} + \gamma_5 \text{Treatment}_{ijt} \cdot \text{Postevent}_{ijt} + \gamma_6 \text{Preevent}_{ijt} + \gamma_7 \text{Treatment}_{ijt} \cdot \text{Preevent}_{ijt} + X_{ijt}Z + u_{ijt}. \quad (3)$$

These models gives the treatment effect of sporting events after the event period by coefficient β_5 and for the pre-event period by γ_7 . The pre- and post-event periods are defined as a three--day period ($t=(-1)-(-3)$) before and a two--day period ($t= 1$ and 2) after the event. A key assumption of the DID-technique is the common trend assumption. This cannot be tested directly, but a non-significance of the pre-event effect could indicate that there is a common price evolution before the event. If the pre-event price effects are significant the common trend assumption is violated. Panel data models cannot be used because it is not possible to track hotel visitors over time. Usually very few guests book the same hotel more than once a year. However, a large number of control variables (hotel fixed effects, year fixed and calendar effects, booking and guest characteristics) are likely to capture a large part of the individual price fluctuations.

The OLS estimator only provides estimates of the average impact of sporting events on room prices. In order to investigate whether there are differences in coefficients at different points in the conditional distribution of hotel room prices, quantile regressions are used (Koenker and Hallock, 2001). According to Buchinsky (1994), it is not sufficient to estimate average effects when examining a heterogeneous population of individuals. Quantile regressions are now standard in tourism and hospitality research (Assaf and Tsionas, 2018). Recent studies use quantile regressions to study the determinants of hotel prices or prices of Airbnb accommodation, see (Masiero, Nicolau and Law, 2015; Wang and Nicolau, 2017). The basic idea is that the strength of the independent variables on the dependent variable varies across the different price categories conditional on control factors. In other words, quantile regression

techniques make it possible to investigate to what extent the price effects of sporting events differ between low- and high-priced hotel rooms (conditional on control factors). Sporting events can have very different effects on the high and low room rates (given the effects of the other booking characteristics). It is likely that the effects of events are greater at high room prices. The participants in sporting events are usually more educated and have a higher income than that of the average tourist. We use simultaneous quantile regression with the bootstrap procedure with 100 repetitions to obtain an estimate of the entire variance-covariance of the estimator.

4. Data and descriptive statistics

Data is based on a hotel reservation system with detailed information on room, guest and booking characteristics covering nine hotels with about 220,000 actual room bookings over a five-year period from year 2011 to 2016. The data contains information on the location of the hotels and day of arrival of the guests so that the sporting events can be matched to the location of the hotel and time period.

The eight biggest sporting events in Finnish Lapland are selected on the basis of information provided by the destination marketing organisation (DMO) of Finnish Lapland and its 14 local suborganisations (<https://www.visitfinland.com/lapland/>). These DMOs offer detailed information on cultural and sporting events. Information on the dates of the eight sporting events is the basis for the empirical analysis (Table 1).

In the winter season from November to April three sporting events are identified and in the summer season there are five sporting events. The sporting events differ considerably in type, duration and tradition. Two events are marathons. The Rovaniemi Marathon is organised by the Lapland Long Distance Running Association and has a relatively short history. Ruskamaraton is a running event in Levi (municipality of Kittilä) held the first Saturday in September and it

is arranged since year 1984. Another event takes place in summer in Levi, which is an exceptional mountain bike event.

Table 1: Overview of the sporting events

Name of the event	Type of sport activities	Period	# days	Founda tion year	Homepage
Kilpisjärvi midsummer	Skiing, orienteering, uphill running and lassoing competition	end of June	3	1950s	http://www.kilpisjarvi.org/en/events/
Kilpisjärvi ice fishing	Ice-fishing competition on frozen lakes	beg. of May	2	1980	http://www.kilpisjarvi.org/en/events/
Rovaniemi Marathon	Marathon	end of June	1	mid 1990s	http://www.rovaniemimarathon.com/en/
Levi Ruskamaraton	Marathon	beg. of September	1	1984	http://www.ruskamaraton.com/
Arctic Rally Rovaniemi	Car rally competition	end of January	3	1966	www.arcticrally.fi/
Levi24 MTB race	Mountain biking	mid of June	2	n.a.	https://www.levi.fi/en/news-events/events/list-of-events/levi-24-mountain-bike-event-2.html
Levi Fis Ski race	Downhill skiing	mid November	3	2008	https://www.fis-ski.com/
Lapponia Hiihto	Cross-country skiing competition	beg of April	5	1978	http://www.lapponiahiihto.fi/en/lapponia-ski-event.html

Source: Local destination marketing organisation and homepage of the sporting events.

The remaining summer sporting events have a long tradition: ice-fishing competition on a frozen lake and a midsummer night outdoor festival which includes several activities in Northern part of Finnish Lapland. The “Only 2 fish’ ice-fishing event” is an ice-fishing competition held early May when the lakes up north are still frozen. The traditional Kilpisjärvi Midsummer Outdoor Activity Event is a three-day event and offers a mix of sport activities.

The winter event includes the Levi FIS Alpine World Cup, which has been taken place since 2008 in mid-November. The Arctic Lapland Rally, also known as Tunturiralli, is an annual rally competition held on ice- and snow-covered roads in Rovaniemi.; organised continuously since 1966. The longest event is the Lapponia Ski Event, which is held annually in April and brings together cross-country skiers from all over the world. It has been organised since 1978 and offers several different distances. The sporting events also differ in terms of their international

reputation. The Levi FIS World Cup is well known internationally, while other festivals are less known internationally and rarely attract many international visitors.

Table 2 contains the definition of the event period and the number of affected bookings. The event period ranges between 1 and 5 days. To define the post-event period, the first day after the end of the event is used and two more nights are added. Similarly, the pre-event period is defined as a three day period ending on the day of the event and starting three days earlier.

The hotel data for the empirical analysis is based on individual bookings of hotel rooms for the period of January 2011 to February 2016. The data originates from a hotel booking system comprising nine three and four-star hotels located in Finnish Lapland (see Falk and Vieru, 2019 for a description of the database). The database contains information on each booking (such as the hotel room rate, the date of arrival, the date of booking, the room category, the number of visitors (adults), information on guests with or without children, the country of residence and the length of stay) (see Table 7 in Appendix for descriptive statistics).

Table 2: Event period and number of affected bookings

Type of event	Location	Event period	Number of treated hotels;	Number of affected bookings	Number of hotels in the control group
Kilpisjärvi midsummer	Kilpisjärvi	24.-26.6.2011, 22.-24.6.2012, 21.-23.6.2013, 20.-22.6.2014, 19.-21.6.2015	1	408	8
Kilpisjärvi ice fishing	Kilpisjärvi	7.5-8.5.2011, 5.5-6.5.2012, 4.5-5.5.2013, 3.5-4.5.2014, 2.5.-3.5.2015	1	251	8
Rovaniemi Marathon	Rovaniemi	2.7.2011, 3.6.2012, 29.6.2013, 28.6.2014, 27.6.2015,	1	595	8
Levi Ruskamaraton	Levi	3.9.2011, 1.9.2012, 7.9.2013, 6.9.2014, 5.9.2015	1	638	8
Arctic Rally Rovaniemi	Rovaniemi	28.-30.1.2016, 22.-24.1.2015, 23.-25.1.2014, 24.-26.1.2013, 27.-29.1.2011	1	538	8
Levi24 MTB race	Levi	11.-12.6.2011, 15.-16.6.2012, 14.-15.6.2013, 13.-14.6.2014, 12.-13.6.2015	1	132	8
Levi Fis Ski race	Levi	11.-13.11.2011 (cancelled), 9.-11.11.2012, 15.-17.11.2013, 14.-16.11.2014, 13.-15.11.2015 (cancelled)	1	363	8
Laponia Hiihto	Muonio, Enontekiö, Pallas, Olos	4.4-8.4.2011, 26.3.-30.3.2012, 2.4-6.4.2013, 7.4-11.4.2014, 7.4-11.4.2015	2	760	7

Source: Local destination marketing organisation and homepage of the sporting events.

In addition, the booking channel (individual offline booking, booking through travel agency, hotel online shop, OTAs) used by the guests are provided. Room rates are generally defined as rates including breakfast and excluding lunch, dinner and other extra services. In some cases, room bookings are packaged, which includes extra services such as on-site lunch and/or dinner, a golf green fee, professional guided walking, and snowmobile tours. In order to make prices comparable, the packaged prices are adjusted using monetary value of the extra service provided by the hotel.

The postal codes of the hotels are linked to the location of the sporting events. In all cases, the affected hotels are located directly in the area of the sporting event, with the exception of Rovaniemi, where the hotel is about 2 km from the start of the Marathon (city centre).

Table 3 shows the median room rates during sporting events (each day at the beginning and end is added to the event period). In addition, the 25th and 75th is calculated. This gives a rough first picture of the possible direction of the impact of sporting events on hotel room prices. First of all, hotel room rates are generally higher in the winter season, which is the high season in Finnish Lapland. For three events in the summer season we find above-average prices and for two events in the winter season. This can also be observed for low and high-priced rooms.

Table 3: Room rates in the event period (Euro)

	P25	P50=Median	P75
Summer season			
Control group	44	65	92
Rovaniemi Marathon affected hotel	44	54	78
Levi24 MTB affected hotel	52	55	70
Levi Ruskamaraton affected hotel	57	94	118
Kilpisjärvi midsummer affected hotel	90	97	106
Kilpisjärvi ice fishing affected hotel	135	174	200
Winter season			
Control group	75	103	140
Arctic Rally Rovaniemi affected hotel	88	104	130
LeviFIS Ski affected hotel	78	95	140
Laponia hiihto affected hotel	91	121	166

Source: hotel booking system.

However, it is difficult to draw meaningful conclusions about price differences from a comparison of median room prices, as room prices depend on guest characteristics (e.g. size of travel group) and booking characteristics (e. g. booking time).

5. Empirical results

The results of Huber's robust M-estimator show that the eight sporting events on average lead to a significant increase in hotel room rates over the event period (Table 4). The coefficient on the interaction term between the event dummy variable and the dummy variable for the affected hotels (Panel B, Model 1) is 0.133 indicating the hotel rooms rates are 14 per cent higher as compared to the control group.¹ Based on OLS estimates, the strength of the price effect of sporting events is somewhat lower with 11 per cent.

The specification controls for guest specific characteristics (e.g. number of guests), booking characteristics (advance booking, booking channel, booking day and arrival day) and seasonal factors (holiday period). The control variables are all significant but not reported (results are available upon request). Quantile regressions (Table 4, Panels C and D), show that the price effects of the sporting events during the event period differ between high- and low-priced rooms (conditional on booking and guest characteristics). The results for the 0.25 and 0.75 quantile regressions show that the short-term price effect is slightly higher for high-priced room rates (9 versus 11 per cent). Overall, the positive price effect of sporting events is not only present but also robust with respect to various estimation methods and in line with the literature and Hypothesis 1.

¹ Calculated as $(\exp(0.133)-1) \times 100$ (Halvorsen and Palmquist, 1980).

Table 4: Price effects of sporting events (pooled over the events)

	Model 1		Model 2		Model3	
Panel A: OLS estimates						
	coeff.	t-stat	coeff.	t-stat	coeff.	t-stat
Sporting event period	-0.044 ***	-12.00	-0.051 ***	-11.99	-0.045 ***	-9.85
Hotels affected X sporting event period	0.112 ***	13.93	0.137 ***	16.30	0.158 ***	17.25
Post sporting event period			0.033 ***	3.54	0.033 ***	3.53
Hotels affected X post sporting event period ^a			-0.138 ***	-8.63	-0.155 ***	-9.52
Pre sporting event period					-0.045 ***	-7.89
Hotels affected X Pre sporting event period ^b					-0.038 ***	-3.72
Wald-test of joint significance of hotel dummy variables of the control group (p)	0.00		0.00		0.00	
Control variables	yes		yes		yes	
R-squared	0.25		0.25		0.25	
Number of observations	220128		220128		220128	
Panel B: Robust regression estimates						
	coeff.	t-stat	coeff.	t-stat	coeff.	t-stat
Period of the sporting events	-0.038 ***	-11.36	-0.034 ***	-9.69	-0.023 ***	-6.45
Hotels affected X sporting event period	0.133 ***	16.89	0.143 ***	17.31	0.151 ***	17.10
Post sporting event period			-0.022 ***	-4.25	-0.023 ***	-4.42
Hotels affected X post sporting event period ^a			-0.067 ***	-4.57	-0.076 ***	-5.16
Pre sporting event period					-0.065 ***	-17.80
Hotels affected X pre sporting event period ^b					0.004	0.50
Wald-test of joint significance of hotel dummy variables of the control group (p)	0.00		0.00		0.00	
Control variables	yes		yes		Yes	
Number of observations	220128		220128		220128	
Panel C: Quantile regression (QR 0.25)						
	coeff.	t-stat	coeff.	t-stat	coeff.	t-stat
Period of the sporting events	-0.001	-0.30	-0.004	-1.26	0.001	0.26
Hotels affected X sporting event period	0.088 ***	14.04	0.092 ***	10.71	0.098 ***	16.69
Post sporting event period			0.016 ***	3.44	0.016 ***	3.72
Hotels affected X Post sporting event period ^a			-0.016 **	-2.09	-0.026 ***	-3.03
Pre sporting event period					-0.039 ***	-10.07
Hotels affected X Pre sporting event period ^b					-0.003	-0.52
Wald-test of joint significance of hotel dummy variables of the control group (p)	0.00		0.00		0.00	
Control variables	yes		yes		Yes	
Number of observations	220128		220128		220128	
Panel D: Quantile regression (QR 0.75)						
	coeff.	t-stat	coeff.	t-stat	coeff.	t-stat
Period of the sporting events	-0.067 ***	-18.51	-0.055 ***	-13.64	-0.045 ***	-11.98
Hotels affected X sporting event period	0.106 ***	14.45	0.112 ***	14.72	0.113 ***	16.18
Post sporting event period			-0.046 ***	-7.73	-0.052 ***	-10.60
Hotels affected X post sporting event period ^a			-0.066 ***	-5.36	-0.068 ***	-5.06
Pre sporting event period					-0.052 ***	-12.59
Hotels affected X pre sporting event period ^b					0.003	0.32
Wald-test of joint significance of hotel dummy variables of the control group (p)	0.00		0.00		0.00	
Control variables	Yes		yes		yes	
Number of observations	220128		220128		220128	

Notes: Asterisks ***, ** and * denote significance at the 1, 5 and 10 per cent level. The dependent variable is the natural logarithm of room rates. Control variables a set of hotel dummy variables for those not affected by the event, booking lead time, year dummy variables, dummy variables for arrival day and for booking day, dummy variables for booking channel and dummy variables for high seasons (Christmas season, winter break, Easter and summer holidays). ^aPost-event period refers to two days after the end of the event. ^bPre-event period refers to three days before the start of the sporting event. (p) is the p-

value of the Wald-test of joint significance of hotel dummy variables of the control group. Robust regression estimates are obtained from Huber's M-estimator. OLS t-static are based on heteroscedasticity-consistent standard errors. Bootstrap quantile regressions are based on bootstrap standard errors using 100 bootstrap replications.

While the significant price effects of sporting events for the main event period were to be expected, the question arises as to the price effect outside the main event period. Results based on the robust regression method show that the coefficient of the interaction term between the affected hotels and the dummy for the pre-event period (with a duration of three days before the start of the event) using Model 3 is not significantly different from zero (coefficient of 0.004 and t-stat of 0.50). Likewise, quantile regression results in Panels C and D show that the price effects of the pre-event period do not differ significantly from zero.

In addition, price effects after the event are tested using Model 2, whereby this period is defined as two additional nights after the end of the event. The results using the robust estimation method show the room rates are 7 per cent lower as compared to the base period. Quantile regressions (QR 0.25) lead to a price effect of 4 per cent indicating that the negative price effect is less pronounced for low price rooms (conditional on other characteristics). These estimates support both the second and fourth Hypotheses.

As there is a negative price effect after the event, it is interesting to calculate the price effect over the whole period, including the post and pre-event periods. This can be achieved by normalizing the price effects of the different periods by the number of days and then calculating the sum. The normalized price effect of the sporting event is 0.060 per day (coefficient of -0.15 divided by 2.5 days) compared to -0.038 (-0.076/2) for the post-event effect and zero for the pre-event effect, based on robust regression estimates. Thus, the negative price effect after the event partly outweighs the positive price effect during the event. This indicates that, on average, the price effects over the longer period are quite small and that possible revenue increases are mainly attributable to the high occupancy rate during the event period rather than higher hotel room rates.

Overall, the results show that the price increase is limited to the event period and is in the medium range. The results are consistent with Depken and Stephenson (2018) using information on a sample of medium-sized sporting events (marathons, football matches and basketball tournaments). For large sporting events, Porter and Fletcher (2008) find much higher increases in room rates during the winter and summer Olympic games in Salt Lake City and Atlanta respectively.

One of the main assumptions of the DID estimation procedure is the "common trend" assumption, which implies that both treatment and control groups would follow a similar trend in the absence of the policy. Even though the common trend assumption cannot be tested, the insignificant coefficient of the interaction term of the affected hotels and pre-event period dummy variable indicate that there is no difference in the evolution of the hotel room rates before the event.

Table 5 shows the results of the difference-in-differences analysis, in which the price effects of sporting events are estimated separately for each event using Model 2. The results using the robust regression method and OLS show that sporting events are associated with higher room rates during the event period in six out of eight sporting events with the price effect ranging between 3.5 per cent and 63.5 per cent $((\exp(0.49)-1)\times 100)$.

Table 5: Price effects of each sporting event

	Robust regression estimates			OLS estimates	
Panel A: sporting events in the summer season					
	coeff	t-stat	Coeff	t-stat	
Hotel affected	0.090 ***	19.67	0.092 ***		23.74
Kilpisjärvi midsummer event period	-0.074 ***	-9.28	-0.092 ***		-11.88
Hotel affected X Kilpisjärvi midsummer event period	0.150 ***	6.24	0.189 ***		11.30
Kilpisjärvi midsummer post-event period	0.046 ***	3.50	0.050 ***		3.61
Hotel affected X Kilpisjärvi midsummer post-event period	-0.003	-0.06	-0.036		-1.14
Controls	yes		yes		
	coeff	t-stat	coeff	t-stat	
Hotel affected	0.091 ***	19.95	0.093 ***		24.39
Kilpisjärvi ice fishing event period	-0.172 ***	-3.91	-0.196 ***		-4.10
Hotel affected X Kilpisjärvi ice fishing event period	0.408 ***	7.84	0.419 ***		7.73
Kilpisjärvi ice fishing post-event period	0.170	0.96	0.157 ***		4.05
Hotel affected X ice Kilpisjärvi fishing post-event period	0.181	0.51	0.211		1.43
Controls	yes		Yes		

	coeff	t-stat	Coeff	t-stat
Hotel affected	-0.020 ***	-6.18	-0.004	-1.27
Rovaniemi Marathon event period	-0.001	-0.14	-0.086 ***	-6.22
Hotel affected X Rovaniemi Marathon event period	0.015	0.71	0.111 ***	4.73
Rovaniemi Marathon post-event period	0.005	0.42	0.230 ***	6.89
Hotel affected X Rovaniemi Marathon post-event period	-0.098 ***	-3.66	-0.333 ***	-8.51
Controls	yes		yes	
	coeff	t-stat	Coeff	t-stat
Hotel affected	-0.133 ***	-	-0.092 ***	-24.07
		44.54		
Levi24 MTB event period	-0.188 ***	-	-0.218 ***	-14.61
		20.21		
Hotel affected X Levi24 MTB event period	0.076 *	1.82	0.059 **	2.51
Levi24 MTB post-event period	-0.165 ***	-	-0.015	-0.43
		12.92		
Hotel affected X Levi24 MTB post-event period	0.040	0.57	-0.136 ***	-3.00
Controls	yes		yes	
	coeff	t-stat	coeff	t-stat
Hotel affected	-0.132 ***	-	-0.091 ***	-23.67
		44.07		
Ruskamaraton event period	-0.178 ***	-	-0.177 ***	-22.04
		19.53		
Hotel affected X Levi Ruskamarathon event period	0.198 ***	9.95	0.140 ***	7.49
Ruskamaraton post-event period	0.003	0.27	-0.023 **	-2.36
Hotel affected X Levi Ruskamaraton post-event period	-0.217 ***	-4.83	-0.222 ***	-4.77
Controls	yes		yes	
Panel B: sporting events in the winter season				
	coeff	t-stat	Coeff	t-stat
Hotel affected	-0.134 ***	-	-0.093 ***	-24.28
		44.66		
Levi FIS Ski event period	-0.072 ***	-3.64	-0.060 ***	-3.80
Hotel affected X Levi FIS Ski event period	0.485 ***	16.01	0.416 ***	15.80
Levi FIS Ski post-event period	-0.069 **	-2.08	-0.105 ***	-3.03
Hotel affected X Levi FIS Ski post-event period	-0.061	-0.49	-0.030	-0.42
Controls	yes		yes	
	coeff	t-stat	Coeff	t-stat
Hotel affected	-0.023 ***	-7.12	-0.008 **	-2.56
Arctic Rally Rovaniemi event period	0.145 ***	15.19	0.125 ***	13.56
Hotel affected X Arctic Rally Rovaniemi event period	0.016	0.72	0.021	1.20
Arctic Rally Rovaniemi post-event period	0.173 ***	9.99	0.133 ***	7.96
Hotel affected X Arctic Rally Rovaniemi post-event period	-0.118 ***	-3.24	-0.098 ***	-3.64
controls	yes		yes	
	coeff	t-stat	Coeff	t-stat
Hotel affected	0.084 ***	24.17	0.091 ***	24.21
Lapponia Hiihto event period	0.056 ***	8.91	0.061 ***	8.04
Hotel affected X Lapponia Hiihto event period	0.054 ***	2.89	0.001	0.05
Lapponia Hiihto post-event period	0.003	0.26	-0.038 ***	-3.06
Hotel affected X Lapponia Hiihto post-event period	-0.090 ***	-2.60	-0.062	-1.50
Controls	yes		yes	

Notes: Asterisks ***, ** and * denote significance at the 1, 5 and 10 per cent level. The dependent variable is the natural logarithm of room rates. Control variables a set of hotel dummy variables not affected by the event, booking lead time, year dummy variables, dummy variables for arrival day and for booking day, dummy variables for booking channel and dummy variables for high seasons (Christmas season, winter break, Easter and summer holidays). Robust regression estimates are obtained from Huber's M-estimator. OLS t-statistics are based on heteroscedasticity-consistent standard errors.

The price effect of sporting events is highest for the Levi FIS Ski competition with 63.5 per cent followed by the ice fishing sporting event with 50 per cent ($=\exp(0.41)$). This indicates

that there is a large heterogeneity in the short-term price effect of sporting events. Thus, the second hypothesis cannot be rejected. The marathon is associated with higher prices in the affected hotel in Levi but not in Rovaniemi. There are several explanations for the large variation in price effects across the various events. For example, the size and the season of the event, the type of event and its tradition, the duration of the event and the international reputation can play a role. The FIS Ski World Cup in Levi, for example, is the best known sporting event in the world compared to the other, more local sporting events considered. Results for the price effects of the post-event period (two additional nights) estimated separately for the eight sporting events show that the price effects are no longer significant at the five per cent level in all cases. In three cases, significant negative price effects can be observed indicating a possible displacement effect. This indicates that the price effects are limited to the event period and wider effects cannot be observed. Table 6 shows the quantile regressions of the price effects of the sporting events during the event period estimated for each sporting event separately. The results for the 0.25 and 0.75 quantile regressions show that in five out of eight sporting events, the short-term price effect is more pronounced for high-priced room rates. This is to be expected if the guests during sporting events tend to belong to higher income and wealth categories with higher willingness to pay than guests during non-event period. Thus, the results supports Hypothesis 4.

In summary, none of the three hypotheses can be rejected. The price effects are modest, limited to the duration of the event and vary greatly depending on the type of sporting event with slightly larger price effects for high-priced rooms (conditional on other factors).

Table 6: Price effect of sporting events (Quantile regressions)

Hotel affected	QR 0.25		QR 0.75	
	coeff.	t-stat	coeff.	t-stat
Kilpisjärvi midsummer event period	0.031 ***	2.60	0.105 ***	7.88
Kilpisjärvi ice fishing event period	0.200 ***	4.44	0.502 ***	13.13
Rovaniemi Marathon event period	-0.010	-1.00	-0.030	-1.08
Levi Ruskamaraton event period	0.092 ***	2.64	0.194 ***	13.83
Levi24 MTB event period	0.200 ***	10.90	-0.097 ***	-3.39
Levi FIS Ski event period	0.430 ***	12.61	0.489 ***	14.36
Arctic Rally Rovaniemi event period	0.098 ***	6.35	-0.010	-0.61
Lapponia Hiihto event period	-0.028	-1.04	0.101 ***	6.84

Notes: Asterisks ***,** and * denote significance at the 1, 5 and 10 per cent level. Bootstrap quantile regressions are based on bootstrapped standard errors with 100 replications.

6. Conclusions

This study analysed the impact of small sporting events on hotel room prices using several sporting events in Finnish Lapland. Previous studies have mainly focussed on the economic impact of major sporting events such as the Olympic Games or the FIFA World Cup. In general, studies that evaluate price effects are underrepresented and studies based on microdata with information on individual hotel room prices are scarce. Since hotels seldom support the events that take place in their neighbourhood, it is important to study their room rate effects.

Robust regression methods show that hotel room prices at sporting events are rising significantly. On average, hotel room prices rise by 14 per cent in the event period. This is much lower than the price effects of major sporting events found in the literature. An important finding is that the price effect of sporting events is limited to the event period. There are no significant positive price effects for the two nights after the sporting event; there are even significant negative price effects. Quantile regressions shows that the price effects are more pronounced for high-priced rooms conditional on control factors. In addition, there is a large variation in the strength of the price effect with the highest effect for the Levi FIS Alpine Ski competition.

Several conclusions can be drawn for decision-makers and hoteliers. The price effects of these small sporting events are in the medium range and are limited to the duration of the event. Hoteliers and municipalities should therefore not be very generous in providing financial

support for events. The price effects also depend strongly on the type of event, although the effects are stronger for internationally known events and longer events.

The analysis of price effects of events based on hotel booking data has several advantages over the analysis based on survey data or aggregate data. Booking data from a property management system covers the entire universe of hotel guests and therefore does not suffer from non-response bias. These data are also rich in various features and allow researchers to examine the price effect of different types of visitors or according to characteristics of the booking (such as chosen booking channel).

Some limitations have to be mentioned. First, the empirical analysis is limited to sporting events. During the period there are also some smaller cultural events (music, cinema and Jazz festivals) that affect prices. However, these are typically smaller and attract a lower number of external visitors. In addition, the cultural events are concentrated in the summer season, where many other accommodation options are available. Second, the analysis is based on booking data of nine hotels belonging to a hotel chain and therefore cannot be generalised for the total universe of hotels in the area. Third, price effects depend on the number of local competitors. In larger cities there is an increasing supply of online short-term rentals (Airbnb accommodations). Also, the higher room occupancy rate during events moderates the modest pricing effect.

There are several ideas for future work. Future work can analyse the hotel price effect of cultural events. This makes it possible to compare the results for the price effects of sporting events with those of cultural events. Another promising area of future research is to re-examine the price effects of sporting events on Airbnb accommodations but new data are needed.

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Appendix

Table 7: Descriptive statistics (percentages)

Booking lead time in days	
0	12.7
1-4	12.9
5-9	11.8
10-24	29.1
25-49	20.2
50-99	8.2
100+	5.2
Arrival year 2011	12.9
Arrival year 2012	14.7
Arrival year 2013	17.7
Arrival year 2014	22.4
Arrival year 2015	26.5
Arrival year 2016	5.8
Arrival day Sunday	13.8
Arrival day Monday	13.2
Arrival day Tuesday	11.4
Arrival day Wednesday	13.5
Arrival day Thursday	14.4
Arrival day Friday	16.3
Arrival day Saturday	17.4
Booking day Sunday	8.5
Booking day Monday	15.9
Booking day Tuesday	17.8
Booking day Wednesday	17.1
Booking day Thursday	16.4
Booking day Friday	15.1
Booking day Saturday	9.2
Non-holiday period	68.2
Summer holidays	16.7
Winter holidays	9.0
Easter holidays	2.1
Xmas holidays	4.1
Number of guests= 1	42.7
Number of guests= 2	50.9
Number of guests= 3	3.7
Number of guests= 4+	2.8
Booking channel travel agency	42.7
Booking channel offline other	22.2
Booking channel own website	7.6
Booking channel OTA	11.1
Booking channel offline business	16.4
Hotel 1*	5.6
Hotel 2	5.3
Hotel 3	17.5
Hotel 4*	4.9
Hotel 5	25.0
Hotel 6*	16.2
Hotel 7*	12.1
Hotel 8	3.4
Hotel 9	9.6

Note: number of observations is 220,128. Asterik * denotes affected hotels. Source: hotel booking system.